Dual Media Filter using Coconut Shell

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Abstract— The purpose of this experimental work is to utilize the waste material such as coconut shells due to which river water and air pollution increases. As we know water is the most important natural resource; it is the most basic human need and a valuable national asset. Efficient development and optimum utilization of water resources, therefore is of great significance to the overall development of country. Water resource management in India is going to be vitally important to sustain the needs of one billion population of India. So we design rapid sand filter with the utilization of coconut shells which reduces hardness of water. Rapid sand filters use relatively coarse sand and other granular media to remove particles and impurities that have been trapped in a floc through the use of flocculation chemicals--typically salts of aluminum or iron. Water and flocs flows through the filter medium under gravity or under pumped pressure and the flocculated material is trapped in the sand matrix.

Key words: Rapid Sand Filter, Coconut shell, COD, BOD, Hardness

I. INTRODUCTION

Water quality index is a means to summarize large amounts of water quality data into simple terms for reporting to management and the public in a consistent manner. Similar to the ultra violet (UV) index or an air quality index, it tells us whether the overall quality of water bodies poses a potential threat to various uses of water.

The rapid sand filter or rapid gravity filter is a type of filter used in water purification and is commonly used in municipal drinking water facilities as part of a multiple-stage treatment system.The first modern rapid sand filtration plant was designed and built by George W. Fuller in Little Falls, New Jersey. Fuller's filtration plant went into operation in 1902 and its success was responsible for the change to this technology in the U.S Rapid sand filters were widely used in large municipal water systems by the 1920s, because they required smaller land areas compared to slow sand filters.

A. Problem Statement:

As we know there are too many temples in India people go there brock coconuts and through waste into the river due to which water pollution increases people burns the waste due to which air pollution increases to utilize this waste we use coconut shells as a filter media which can reduces the pollution.

II. FUTURE SCOPE

- Utilization of waste generated at religious places such as ramkund, Nasik.
- The filter can be designed as potable filter for places where large treatment plants cannot be established.
- Can be alternative to sand filter.

A. Test Programme:

The test program is so devised so as to find out impurities present in water. In this test program we compare minimum and maximum values of test results. The following test are conducted on water

- BOD (Biochemical Oxygen Demand).
- PH Value.
- Hardness Test.
- Temperature.

III. MATERIALS USED IN RAPID SAND FILTER

Fine aggregates, coarse aggregates, coconut shells are use to make a rapid sand filter. The specifications and properties of these materials are as under:

A. Fine & Coarse Aggregates:

Locally available sand is used as fine aggregate in the filter. The physical properties and sieve analysis of results of sand.

The physical properties and sieve analysis of results of both coarse aggregate. sand is porous and permeable that's why it is used in sand filter.Well sorted sand has high permeability , suitable for drainage materials and espicialy if pure quartz sand , for water filtration.

Sr.No	Characteristics	Value	Value
1	Specific gravity	2.56	2.65
2	Bulk density loose (kg/lit)	1.48	-
3	Fineness modulus	2.51	6.47
4	Water Absorption	2.06%	3.645%
5	Grading Zone	Zone III	Zone II

Table 1: Physical Properties of fine and sand

B. Coconut Shell:

- Coconut shell is a high grade carbon coconut shell carbon has been proven highly effective for the removal of tastes and odors.
- Coconut shell carbon provides a significantly higher volume of micropores than carbon.

C. Design of dual media filter:

No. of units = 1 no. (Potable type filter)
Size of bed = 0.3 * 0.18 m
Area of filter bed = 0.06 sq.m
Effective height of filter = 0.37m
Depth of crushed coconut shell media = 0.07m
Avg. Size of coconut shell media = 1-2 mm
Uniformity coefficient = 1.47
Depth of fine sand media = 0.4 m
Effective size of fine sanf = 0.5mm
Depth of coarse sand media = 0.1m
Depth of supporting gravel = 0.07m
Depth of covering top layer = 0.03m

IV. TEST PROCEDURE

A. Bod (Biochemical Oxygen Demand):

Procedure:

Preparation of dilution water:

1) The source of dilution water may be distilled water, tap or receiving-stream water free of biodegradable organics and bioinhibitory substances such as chlorine or heavy metals.
2) Aerate the required volume of dilution water in a suitable bottle by bubbling clean-filtered compressed air for sufficient time to attain DO saturation at room temperature or at 20ºC/27ºC. Before use stabilize the water at 20ºC/27ºC.
3) Add 1mL each of phosphate buffer, magnesium sulphate, calcium chloride and ferric chloride solutions in that order for each Liter of dilution water. Mix well. Quality of dilution water may be checked by incubating a BOD bottle full of dilution water for 5 days at 20ºC for 3 days at 27ºC. DO uptake of dilution water should not be more than 0.2mg/L and preferable not more than 0.1mg/L.
4) For wastes which are not expected to have sufficient microbial population, seed is essential. Preferred seed is effluent from a biological treatment system. Where this is not available, supernatant from domestic wastewater (domestic sewage) settled at room temperature for at least 1h but not longer than 36hours is considered sufficient in the proportion 1-2mL/L of dilution water. Adopted microbial population can be obtained from the receiving water microbial population can be obtained from the receiving water body preferably 3-8 km below the point of discharge. In the absence of such situation, develop an adapted seed in the laboratory.
5) Determine BOD of the seeding material. This is seed control. From the value of seed control determine seed DO uptake. The DO uptake of seeded dilution water should be between 0.6mg/L and 1mg/L.

B. PH Value:

1) Before use, remove electrodes from storage solutions (recommended by manufacturer) and rinse with distilled water.
2) Dry electrodes by gently blotting with a soft tissue paper, standardize instrument with electrodes immersed in a buffer solution within 2 pH units of sample pH.
3) Remove electrodes from buffer, rinse thoroughly with distilled water and blot dry.
4) Immerse in a second buffer below pH 10, approximately 3 pH units different from the first, the reading should be within 0.1 unit for the pH of second buffer. (If the meter response shows a difference greater than 0.1 pH unit from expected value, look for trouble with the electrodes or pH meter)
5) For samples analysis, establish equilibrium between electrodes and sample by stirring sample to ensure homogeneity and measure pH.
6) For buffered samples (or those with high ionic strength), condition the electrodes after cleaning by dipping them into the same sample, and read pH.
7) With poorly buffered solutions (dilute), equilibrate electrodes by immersing in three or four successive portions of samples. Take a fresh sample and record the pH.

C. Chlorine Test:

Procedure:

– Volume of sample: Select volume that will require not more than 20mL 0.01N Na2S2O3 and not less than 0.2mL for the starch-iodide end point. For a chlorine range of 1 to 10mg/L., use a 500mL sample: above 10mg/L, use proportionately less sample. Use smaller samples and volumes of titrant with the amperometric end point.
– Preparation for titration: Place 5ml acetic acid, or enough to reduce the pH between 3.0 and 4.0, in a flask or white porcelain casserole. Add about 1g Kl estimated on a spatula. Pour sample in and mix with a stirring rod.
– Titration: Titrate away from direct sunlight. Add 0.025N or 0.01N Na2S2O3 from a burette until the yellow colour of the liberated iodine almost id discharged. Add 1mL starch solution and titrate Na2S2O3 instead of 0.01N, then, with a 1L sample, 1drop is equivalent to about 50g/L. It is not possible to discern the end point with greater
– Hardness Test.
– Total hardness
– Take 25 or 50mL well mixed sample in porcelain dish or conical flask.
– Add 1-2mL buffer solution followed by 1mL inhibitor.
– Add a pinch of Eriochrome black T and titrate with standard EDTA (0.01M) till wine red colour changes to blue, note down the volume of EDTA required (A).
– Run a reagent blank. Note the volume of EDTA (B).
– Calculate volume of EDTA required by sample, C = (A-B).
– For natural waters of low hardness, take a larger sample volume, i.e. 100-1000mL for titration and add proportionately larger amounts of buffer, inhibitor and indicator. Add standard EDTA titrant slowly from a micro burette and run a blank using redistilled, deionised water of the same volume as sample. Apply blank correction for computing the results.

V. RESULTS

Test On Water	Before	After
Bod	14.66	10.66
Cod	44	32
Hardness	78	44
Ph Test	8.30	7.03

Table 2:

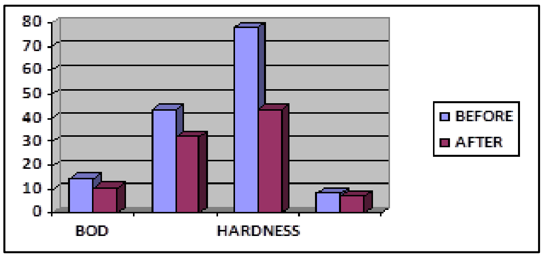

Fig. 1:

Test On Water	Required	Persive
Bod	6	10.66
Cod	28	32
Hardness	60	44
Ph Test	7	7.03

Table 3:

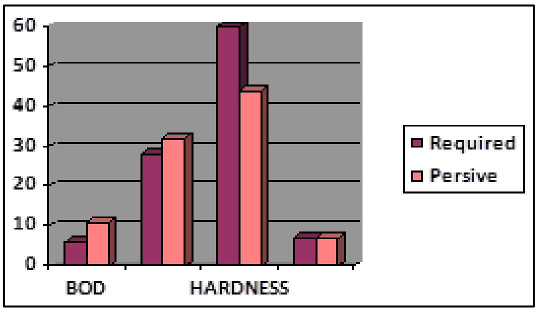

Fig. 2:

According to the result we can conclude that the water is suitable for drinking. As per the result obtain and result required are nearly achieve hence the water is suitable for drinking purpose.

VI. Conclusions

The water quality assessment of godawari river in nasik dist. from kushawart to saikheda village in Maharashtra state indicates that river is heavily pollued due to 125 and 350 medium scale units and above 2500 small scale unit, in addition to massive growth of some others industries like laundry, hostels, restaurant, photological laboratories, nursing homes etc., which are discharging into the river the national sanitation foundation water quality from 2002 to 2007 (from cpcv and mpcv) indicate that the study streach had bad water quality upto 2006, but that improve to medium due to conservation facilities implemented in 2005. the water quality has not improve beyond medium range upto fed 2008, perhaps due either to the fact that current facilities have become indicate or ase not properly functioning. it is therefore suggested that in the light present development in the study search there is need to release the require facilities and to acheive the targets.

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